

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **09-204924**

(43)Date of publication of application : **05.08.1997**

(51)Int.Cl.

**H01M 8/04**

**F24F 6/02**

**H01M 8/02**

**H01M 8/10**

(21)Application number : **08-010604**

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(22)Date of filing : **25.01.1996**

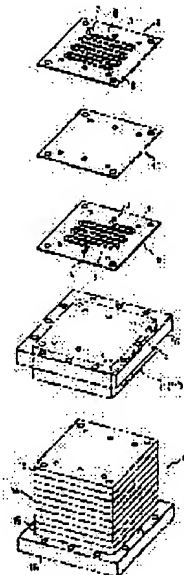
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## (54) METHOD FOR HUMIDIFYING GAS OF PEM TYPE FUEL CELL AND GAS HUMIDIFIER

(57)Abstract:

PROBLEM TO BE SOLVED: To automatically and efficiently humidify a gas without using a bubbler by passing cooling water on the cooling water passage side on one surface of the polymer electrolytic film and passing the gas on the gas passage side on the other surface, and humidifying the gas.

SOLUTION: A cooling water plate 5 has a cooling water passage 2 laterally reciprocating and meandering in parallel, which is formed on the center part of a square thin conductive gas impermeable base 1, and having an inlet 3 and an outlet 4 formed on both the ends. A gas plate 9 has a gas passage 6 laterally reciprocating and snaking in parallel, which is formed on the center part of a base 1, and having an inlet and an outlet 8 formed on both the ends. The gas plate 9 is laminated on the cooling water plate 5 in such a manner that the passages 2, 6 are mutually opposed through a solid polymer electrolytic film 10. The cooling water plate 5 and the gas plate 9 in a gas humidifier 11 are formed of thin conductive bases subjected to whole surface gas impermeable treatment. Thus, since the water raised in temperature by cooling a stack 14 in a generating area is transmitted by the electrolytic film 10 and evaporated on the gas side, the gas can be humidified.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

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[Claim]

[Claim 1] The gas humidification technique of PEM type fuel cell which sets to humidify the gas supplied to PEM type fuel cell stack, a cooling water path and a gas passageway are made to counter on both sides of a solid-state polyelectrolyte layer, carries out the polymerization of the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway, and is characterized by circulating cooling water to the cooling water path side of one side of a solid-state polyelectrolyte layer, circulating gas to the gas-passageway side of other one side, and humidifying gas.

[Claim 2] The gas humidifier of PEM type fuel cell which carries out the laminating of a large number, and becomes so that a solid-state polyelectrolyte layer may be intervened and a cooling water path and a gas passageway may counter the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway.

[Claim 3] The gas humidifier of PEM type fuel cell which carries out the laminating of a large number, and becomes so that a solid-state polyelectrolyte layer may be intervened and a cooling water path and a gas passageway may counter the gas-cooling water plate which intervened the separator, joined with glue the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway, and was unified.

[Claim 4] The claim 2 characterized by being what the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway become from the thin shape conductivity substrate of whole surface gas processing in which it does not penetrate, respectively, or the gas humidifier of PEM type fuel cell given in three.

[Claim 5] The claim 2 characterized by being what the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway become from the thin shape conductivity substrate to which only each cooling water path and the gas passageway left the permeability of the permeability gas of water, and carried out gas processing in which it did not penetrate of other fractions, or the gas humidifier of PEM type fuel cell given in three.

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DETAILED DESCRIPTION

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[Detailed description]

[0001]

[The technical field to which invention belongs] this invention relates to the gas humidification technique and the gas humidifier of PEM type fuel cell.

[0002]

[Prior art] It is H<sub>2</sub> in order to gather the generating efficiency of PEM type fuel cell conventionally. Gas is humidified. H<sub>2</sub> In order to humidify gas, it humidifies through the warm water in the bubbler of heater heating, and it is this humidification H<sub>2</sub>. Gas is supplied to the fuel cell.

[0003] By the way, H<sub>2</sub> by the bubbler of this heater heating In humidification of gas, power consumption is large and humidification luminous efficacy is bad. Moreover, H<sub>2</sub> In order to make humidification of gas proper, it is the bubbler temperature TB. Cell temperature TC of a fuel cell You have to control two. however, TB >> TC the time -- humidification over -- the inside of a cell -- dewing -- gas -- getting it blocked -- the shortage of gas -- being generated -- a generating efficiency -- falling -- moreover, TB << TC it is -- the time -- the insufficiency of humidification -- a generating efficiency -- falling -- since -- TB = TC The control domain was narrow and control was very difficult. And since it changes also with current density and high humidification was demanded in the high current density side, control was much more difficult for the grade of humidification. Moreover by bubbler reserving, miniaturization of PEM type fuel cell cannot be attained.

[0004]

[Object of the Invention] Then, this invention tends to offer the gas humidification technique and the gas humidifier of PEM type fuel cell which can humidify efficiently automatically and can attain miniaturization of PEM type fuel cell, without using the bubbler of heater heating.

[0005]

[The means for solving a technical problem] The gas humidification technique of PEM type fuel cell of this invention for solving the above-mentioned technical problem makes a cooling water path and a gas passageway counter on both sides of a solid-state polyelectrolyte layer, and carries out the polymerization of the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway, cooling water is circulated to the cooling water path side of one side of a solid-state polyelectrolyte layer, gas is circulated to the gas-passageway side of other one side, and it is characterized by humidifying gas.

[0006] The laminating of a large number is carried out, and one of the gas humidifiers of PEM type fuel cell of this invention becomes so that a solid-state polyelectrolyte layer may be intervened and a cooling water path and a gas passageway may counter the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway.

[0007] The laminating of a large number is carried out, and other one of the gas humidifiers of PEM type fuel cell of this invention becomes so that a solid-state polyelectrolyte layer may be intervened and a cooling water path and a gas passageway may counter the gas-cooling water plate which intervened the separator, joined with glue the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway, and was unified.

[0008] In the gas humidifier of the two above-mentioned PEM type fuel cells, the cooling water plate which has a cooling water path, and the gas plate which has a gas passageway The cooling water plate with which it is desirable that it is what consists of a thin shape conductivity substrate of whole surface gas processing in which it does not penetrate, respectively with plate, and it has a cooling water path, Only the gas plate which has a gas passageway, each cooling water path, and a gas passageway leave the permeability of water, and the permeability of gas, and it consists of a thin shape conductivity substrate which carried out gas processing in which it did not penetrate of other fractions, and comes out, and a certain thing is also desirable.

[0009]

[Gestalt of implementation of invention] As mentioned above the gas humidification technique of PEM type fuel cell of this invention By sending the humidified gas to a power generation area, since cooling water is circulated to the cooling water path side of one side of a solid-state poly membrane, gas is circulated to the gas-passageway side of other one side and gas is made to humidify Moreover, since generation of heat of a power generation area is suppressed by the cooling effect of the low humidification area of temperature and the temperature of both areas becomes equal automatically by it, it comes to be able to perform power generation stabilized efficiently in a power generation area.

[0010] Moreover, like the above, the gas humidifier of PEM type fuel cell of the constituted this invention turns into a thin shape and a compact lightweight gas humidifier cheap moreover, and can attain miniaturization of PEM type fuel cell by uniting with the stack of a power generation area in the humidification area of a fuel cell.

[0011]

[Example] The example of the gas humidification technique of PEM type fuel cell of this invention and a gas humidifier is explained. An example of a gas humidifier is explained first. As shown in drawing 1, in parallel with the center section of 0.36mm in thickness, and the thin shape conductivity gas non-penetrated substrate 1 of one side a 120mm rectangle The cooling plate 5 which formed in right and left the cooling water path 2 with a width of face [ which carries out both-way meandering ] of 2mm, and formed the inlet 3 and the outlet 4 in the ends 0.36mm in thickness One side In parallel with the center section of the thin shape conductivity gas non-penetrated substrate 1 of a 120mm rectangle They are 50 micrometers in thickness, and one side about the gas plate 9 which formed in right and left the gas passageway 6 with a width of face [ which carries out retaliation meandering ] of 2mm, and formed the inlet 7 and the outlet 8 in the ends. The 120mm solid-state polyelectrolyte layer 10 is intervened. The gas humidifier 11 which shows carrying out a laminating so that the cooling water path 2 and the gas passageway 6 may counter repeatedly to drawing 3 5 times as shown in drawing 2 was constituted.

[0012] The cooling water plate 5 and the gas plate 9 in the above-mentioned gas humidifier 11 consist of a thin shape conductivity substrate of whole surface gas processing in which it does not penetrate.

[0013] Moreover, in case the above-mentioned gas humidifier 11 is constituted, in order to simplify a laminating, as shown in drawing 4, the solid-state polyelectrolyte layer 10 is arranged on both sides of the cooling water plate 5, and as shown in \*\*\*\*\* drawing 5, laminating adhesion may be carried out and you may unify.

[0014] Next, other examples of a gas humidifier are explained. About the cooling water plate 5 and the gas plate 9 same as shown in drawing 6 as the thing in the gas humidifier 11 of the aforementioned example, they are 0.36mm in thickness, and one side. It intervened and the separator 12 of a 120mm rectangle was joined with glue with 2 fluidity springiness epoxy system adhesives, as shown in drawing 7, it unified, and the gas-cooling water plate 13 was made. Gas humidifier 11' which repeats intervening 50 micrometers in thickness and the 120mm one side solid-state polyelectrolyte layer 10 as shown in drawing 8, and carrying out the laminating of this gas-cooling water plate 13 so that the cooling water path 2 and the gas passageway 6 may counter 5 times, and shows it to drawing 9 was constituted.

[0015] Although the cooling water plate 5 and the gas plate 9 in this gas humidifier 11' consist of a thin shape conductivity substrate of whole surface gas processing in which it does not penetrate, only the cooling water path 2 leaves the permeability of water, the cooling water plate 5 consists of a thin shape conductivity substrate which carried out gas processing in which it did not penetrate of other fractions, only a gas passageway 6 may leave the permeability of gas and the gas plate 9 may consist of a thin shape conductivity substrate which carried out gas processing in which it did not penetrate of other fractions.

[0016] When the example of the gas humidification technique of this invention is very explained, as shown in drawing 10, respectively, the gas humidifier 11 (11') of the aforementioned configuration to the stack 14 of the power generation area of PEM type fuel cell H2 which intervenes, carries out the polymerization of the dummy plate 15, bundle-arrival-unites with the vertical both sides on both sides of the dummy plate 15 on a laminating top and the metal plates 16 and 16, assembles PEM type fuel cell 17, and is supplied to the stack 14 of a power generation area Gas is humidified. Namely, H2 of the temperature of 20 degrees C, and 0% of humidity which is fuel gas at the gas passageway 6 (refer to drawing 1) of one side of the solid-state polyelectrolyte layer 10 of the gas humidifier 11. It is the above H2 at a part for 11./about the 70-degree C water which gas was circulated by part for 31./, and has cooled the stack 14 of a power generation area to the cooling water path 2 (refer to drawing 1) of other one side. It was made to circulate by the Consequently, the solid-state polyelectrolyte layer 10 is penetrated, it evaporates by the gas-passageway 6 side, and 70-degree C water is H2. Gas was humidified efficiently automatically. These H2 humidified As soon as it is sent to the stack 14 of a power generation area, and generation of heat of a power generation area is suppressed by the cooling effect of the low humidification area of temperature and the temperature of both areas spread abbreviation etc. automatically, in a power generation area, power generation of gas stabilized efficiently came be completed.

[0017]

[Effect of the invention] Since according to the gas humidification technique of PEM type fuel cell of this invention the water with the high temperature which has cooled the stack of a power generation area penetrates a solid-state polyelectrolyte layer and evaporates in a gas side so that it may understand by the above explanation, it is humidified efficiently automatically, without using the bubbler of heater heating. And generation of heat of a power generation area is suppressed by the cooling effect of sending this humidified gas to the stack of a power generation area, and the low humidification area of temperature, and power generation on which the temperature of both areas spreads abbreviation etc. automatically and which was efficiently stabilized since it became can be performed.

[0018] Moreover, by uniting with the stack of a power generation area in the humidification area of a fuel cell, the gas humidifier of PEM type fuel cell of this invention can perform the above-mentioned humidification technique accurately, and it can attain miniaturization of a fuel cell while operation by which the fuel cell was stabilized can be performed.

[Translation done.]